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A N
INAUGURAL DISSERTATION
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COMPRESSION OF THE BRAIN FROM
CONCUSSION.

SUBMITTED TO THE PUBLIC EXAMINATION
OF THE
FACULTY OF PHYSIC,
UNDER THE AUTHORITY OF THE
TRUSTEES OF COLUMBIA COLLEGE
IN THE
STATE OF NEW-YORK:
WILLIAM SAMUEL JOHNSON, LL.D. President;
FOR THE DEGREE OF
DOCTOR OF PHYSIC;
ON THE THIRTIETH DAY OF APRIL, 1793.

BY JOHN B. HICKS,

Citizen of the State of New-York.

Experience and Observation, the Parents of the Healing Art.

LEDUAN.

21932

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Imprimatur.

Richard Bayley.

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TO THE
MEDICAL SOCIETY
OF THE
STATE OF NEW-YORK:

GENTLEMEN,

*PERMIT me to address this
INAUGURAL ESSAY, not as worthy of your
sanction, but, as an evidence of esteem, respect, and
gratitude.*

From your much obliged,

Humble Servant,

The AUTHOR:

ISAAC ROOSEVELT, President,
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GOVERNORS OF THE NEW-YORK HOSPITAL.

GENTLEMEN,

YOUR liberal exertions in support of the NEW-YORK HOSPITAL demand my approbation as a citizen, and gratitude as a child of the institution.

Your judicious selection of MEDICAL OFFICERS not only effectuates the public bounty to those victims of disease who are objects of the institution,

tution, but enables the patrons of the **HEALING ART** to establish one of the first **PRACTICAL MEDICAL SCHOOLS** on the Continent of America.

You have combined in the same body, a source of balm to the afflicted, and observation for the advancement of the most noble of sciences; and thus the remotest parts of the habitable globe will participate the fruits of your benevolence.

As men studious to promote the arts and sciences, permit me to suggest the flourishing state of **MEDICAL EDUCATION** in this city. An institution recently adopted by **COLUMBIA COLLEGE**, nearly allied to, and cherished by the one under your direction, though in its infancy, supported by the Pillars of Literature, is now emerging from obscurity, and will soon shine conspicuous by its tendency to diffuse **USEFUL KNOWLEDGE**.

How pleasing the reflection, that, in this institution, **COLUMBIA** boasts of a youth of genius and erudition, unequalled in the history of science.*

May **PROVIDENCE** continue to be your guide, and your future administration be such as to merit a continuance of the confidence of those whom you have the honour to represent.

I remain,

With much esteem and respect,

Your obliged,

And very humble Servant,

The **AUTHOR**;

* Professor **MITCHILL**.

INTRODUCTION.

INTRODUCTION.

THE Sensorium Commune has attracted the attention of the ablest Philosophers. Its physiology has eluded the researches of ingenuity and industry, is involved in obscurity, and hence the uncertainty of the pathology. We have to lament the impossibility of exploring this hidden, important, and inimitable machine of INFINITE WISDOM.

Though Surgery has rapidly improved for a few years past, still, within its province exist a variety of diseases; the cause, nature, and cure of which baffle the ingenuity of Surgeons.

Although the observations which I now submit to public scrutiny constitute my INAUGURAL ESSAY, they were not composed merely in compliance with the STATUTES of the institution under whose sanction I publish, but from a full conviction of their propriety; for though they have been subjects of investigation, since Surgery has been cultivated as an art, we are in possession of no satisfactory information respecting them.

In prosecuting these subjects, an interesting question offers for critical examination; to wit, Are the diseases known in surgical authors, by concussion and compression of the brain, essentially different?

It is of infinite moment in practice to have diseases defined with accuracy; for though modern industry has unburthened Surgery of its ancient barbarity, yet, in many instances, we are under the disagreeable necessity of obtaining the aid of painful and dangerous operations; and hence the question stated has not only agitated and perplexed our predecessors, but the ablest of our contemporaries are embarrassed, and have split on this ground.

Though I am bold to relinquish the beaten tract, and controvert the theory and practice of eminent Surgeons, I presume I shall not be impeached with a thirst for novelty or a spirit of controversy. If I have advanced opinions repugnant to established practice and great authority, it has been with all deference; from a conviction of their propriety, and a desire of alleviating the calamities attendant on mortality.

The ignorant, illiberal, and rash may charge me with vain presumption; but the wise, candid, and deliberate will applaud my independence.

This disparity of sentiment is not peculiar to the healing science; but we are not equally interested and
solicitous

solicitous for the purity of each: On one the health and lives of society are depending; the others are more the inquiries of curious speculation than real utility. I am an advocate for lenity; but when I contemplate the nature and importance of the subject, I spurn at the degeneracy of authors.

The imperfect state of this part of science has arisen, in some degree, from its intricacy, servile and superstitious veneration for authority; but depravity of principle has had its influence; and thus the light of truth has been obscured by the shadow of the imagination; and to establish a favourite hypothesis, facts have been coined, and wanton cruelties practised.

We are restrained by humanity, and prohibited by the laws of civil society, from sporting with the calamities and lives of the human creation; and hence the propriety of the obligation makes every consideration subordinate to the welfare of the patient. This, however humiliating, and painful to the reflection, is too frequently abandoned, and interest and ambition predominate.

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INAUGURAL DISSERTATION, &c.

IT is almost unnecessary to remark, that this disease is not peculiar to any season or climate; every part of the habitable globe, both sexes, all ages, and every variety of constitution are the objects of its vengeance. A complete or imperfect, general or partial suspension of the intellectual operation, sense, and voluntary motion, from external violence, with the continuance of respiration and circulation, is a definition sufficiently clear and distinct, and plainly enough directing the indications of cure. But in obedience to custom, and further, because the variety marked has contributed to give rise to an opinion and method of cure which, in the subsequent part of this essay, I shall take the liberty to controvert; I proceed to mark, with precision, the history in particular.

When

When the violence is inflicted the following is the order of symptoms.

The person being thrown to the ground, lies apparently lifeless to the most accurate examination. The body, face, and extremities are pale and cold; the eyes lose their sprightliness, become languid; and assume a deadly appearance; the action of the heart and arteries, and the function of respiration, are not perceptible, or extremely obscure.

In this situation he continues for a longer or shorter time, and too frequently ends his existence: But generally the involuntary organs recover their suspended operations.

The breathing is deep, sonorous, laborious, and slow; the pulse irregular, labouring, and oppressed; but, sometimes the lungs play with freedom and ease, the pulse is free, soft, regular, and full; and, in short, the state of the *vital functions* corresponds to that of *sleep*.

The face is flushed, and often livid; the eyes turgid, and the pupils dilated; the stomach is affected with nausea, sickness, and vomiting; intestines constipated; and these symptoms are frequently accompanied with an effusion of blood from the nose, ears, and eyes.

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The muscles, subservient to the will, are variously convulsed; particularly the muscles of one side are violently agitated with alternate contractions and relaxations, while those of the opposite are in a state of perfect paralyfis.

These convulsions are often extremely obscure, the muscles being affected simply with tremor, especially manifest in the distortion of the features of the face.

Thus situated for an unlimited time, suspended between hope and despair, we have no certainty of approaching death, nor evidence to warrant a conjecture of probable recovery.

At length the symptoms are mitigated, the breathing becomes more free and easy; the pulse regular, full, more quick, and frequent; sensibility in some degree returns; he is restless, awake to active stimuli, is sensible to light; the pupils contract, the eyes exhibit the appearance of intoxication, “and he talks incoherently.”

Thus, *gradem per gradem*, he verges from the jaws of death, again to exercise the functions of life, and exhibit health, that inestimable blessing. Some degree of fatuity continues for a short time; and we have instances of its continuing for life, accompanied with paralyfis.

Our

Our efforts to obtain this salutary termination are frequently baffled; the disease pursues a different course; and instead of the symptoms last detailed, those of an opposite complexion take place. The breathing is small, slow, and very obscure; the patient is absolutely insensible; his pupils remain fixed and dilated when exposed to the strongest light; his face and extremities are pale and cold, pulse small, very slow, weak, and intermittent; the urine and fæces pass involuntarily; and now all hopes of cure are precluded, and death is at hand. At length general convulsions supervene and conclude this painful scene.

REMOTE CAUSES.

AUTHORS have generally considered the division of the remote causes into occasional and predisposing, as superfluous; because, (say they) the exciting never requires the aid of predisposition, and the disease always arises from their power alone.

That this is generally the case will not be denied. But, I will risk an opinion, that instances have occurred where the disease has been avoided from the absence of predisposition, and in every occurrence is aggravated thereby.

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The necessity of this further appears, and is particularly enforced by its influence in determining the prognosis, and directing the indications of cure.

OCCASIONAL CAUSE.

COMMOTION or concussion of the brain.

PREDISPOSITION.

THIS I hold to consist in a phlethoric state of the system in general, and of the head in particular. General phlethora may arise from original stamina, a liberal use of animal food and spirituous liquors; frequent intoxication, sedentary life, imbecility in the intellectual operation, interruption or suppression of the secretions, suppression of accustomed evacuations; and, we are told that frequent bleeding will have the same effect.

Phlethora of the head, in particular, may depend on original conformation.

A large head, short neck, contracted thorax, and a constitutionally less capacity of the lungs in proportion to the other parts of the body.

Corpulent

Corpulent habit, ossification of the valves of the heart, and debility of the same.

Causes referred to the lungs, variously interrupting, impeding, and retarding the minor circulation.

Effusions of blood, serum and extrication of air in the cellular substance of the lungs.

Hydrops pericardii, hydrothorax, spasms, rigidity, and tremors; tympanites, aneurisms, ascites, amputation; youth, old age; and, in short, whatever will increase the determination to, or prevent the return of blood from the head, will produce a phlethora of the same.

PROXIMATE CAUSE.

THE question which I am now to discuss, is as interesting to the Patient, intricate and perplexing to the Practitioner, as any within the jurisdiction of Surgery.

Surgeons have agreed on the cause, nature, and cure of compression of the brain from external violence; imputing the disease to compression, depending on extravation, congestion, depression of bone, and the introduction of foreign substances: But
the

the fancy of modern inquisitors has invented a new species of disease, entitled Concussion of the Brain; though of a nature diametrically opposite, in the character so nearly allied to compression, that the distinction would elude the penetration of a *Newton*.

With all deference to such authorities, I believe the same to have no existence in nature, and to be a phantom of the imagination only.

This distinction was first suggested by the French,* who are unbounded in ambition, enthusiasts in novelty, happy at invention, and fond of the marvellous.

Like contagion it has diffused its noxious influence, assimilated the Surgeons of the adjacent and remotest countries; and to this cause too many owe their dissolution.

Authors of a more recent date, unsatisfied with the observations of their predecessors, have refined on refinement; the former having denied the existence of compression in concussion, to which the latter have added debility as the proximate cause, and attributed to concussion a direct sedative operation, analogous to contagion, cold, fear, and other known sedatives.† What a stretch of the imagination!

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I have

* Sharp's Critical Inquiry.

† Bell's System of Surgery.

I have attentively weighed, and revolved in my mind, in the most favourable point of view, the arguments urged in support of concussion independent of compression, and I am sorry to say, I have not been able to discover a rational foundation; and no doubt exists with me as to the fallacy of their observations.

Upon the whole, I presume I shall clearly maintain, that the variety of the phænomena marked in the history of compression, and other circumstances; on which the doctrine of concussion has been founded, may be referred to a difference in the predisposition, &c. which gives no essential difference, implies an analogous operation in the occasional cause, marks a variety only, and shews the deception of experience.

Though I have rejected the idea of excluding compression in what authors denominate concussion, I admit that debility is induced, is to be sought for to explain many phænomena, and is of infinite moment in the method of cure.

This debility I hold to be indirect, the result of excessive stimulus, and not the immediate effect of direct sedative powers.

From

From this consideration only we can explain the instantaneous suspension of life, and immediate restoration of the same, when the brain is subjected to violent concussion.

That debility, and not compression, is the cause of the phænomena in this instance, is obvious from the following reflections.

What reason can be given why the functions of life, after a complete suspension, instantly return to exercise with their usual energy?

Absorption is a tedious, laborious process, and no one acquainted with the laws of the *animal economy* can conceive extravasation and absorption in the instance mentioned; and it is equally improbable that congestion existed.

All causes, so far as they have a mechanical operation, are, to the human body, direct stimulants. By comparing the phænomena of concussion with the morbid effects of electricity, joy, anger and pain, the most perfect analogy must strike the unprejudiced and enlightened mind.

As the phænomena of concussion have the strictest resemblance to those of electricity, &c. it is unphilosophical

lofophical to fay, that the fame effects result from oppofite caufes.*

Having refuted the idea of direct, and eftablifhed, upon invulnerable ground, the exiftence of indirect debility, it remains to fhew the exiftence of compreffion in concuffion.

This I conceive a difficult task, more fuited to age, experience and obfervation, than calculated as an exercife for a youth yet an infant in his profeflion.

Necelfity needs no apology, and I affume the arduous undertaking with that diffidence becoming my period of life.

I have already maintained the exiftence of debility resulting from concuffion; it may feem paradoxical now to urge the necelfity of compreffion.

I wifh to be clearly comprehended. The opinion I have already advanced has a relation to circumftances, feldom the objects of furgical obfervation.

No one is ignorant, that inftances daily occur, where life is fufpended by falling from a height on the feet, head, or other parts; and on the moft accurate examination, we have no evidence of folution of continuity, contufion, extravafation, or congeftion.

We

* " Identity of effect implies identity of caufe." .

We have a more familiar example of this in the impious and shameful practice of boxing. We have all witnessed, and many have experienced what pugilists consider as an invariable rule, that a blow under the ear, between the mastoid process of the temporal bone and angle of the jaw, throws the victim to the ground, where he lies apparently inanimate; but in a few moments he is revived, renews the contest, and engages his antagonist with redoubled energy.

This state of concussion is not what Surgeons are contending about. When the *intellectual faculties*, *sense* and *voluntary motion* are no more, and the *vital functions* continue to display themselves; when these exist to a considerable degree, and are of some duration, they constitute what is to many simple concussion, and to others complete compression.

I hold it as a principle in *physiology*, that a free and uninterrupted state of the *nervous power*, (whatever that may be,) is necessary to the existence and exercise of the *intellectual faculties*, *sense* and *voluntary motion*.

It is equally true, that the *animal functions* may be suspended, and the *vital* continue in action. It appears, therefore, that a cause capable of effecting the first, may be inadequate to the second; and that in the disease now under consideration, though an injury

injury of some kind has arrested the *animal*, the *vital organs* are supported by that state of the *sensorium*, or *nervous energy*, which, though insufficient for the former, is equal to the latter. I am aware of the objection, that the phænomena which I have just laid down as depending on compression, are frequently the effects of a state of the *nervous system*, in which we have, (say they) no cause to suspect compression.

The first of which is *sleep*.

That this state is not produced by extravasation is obvious; but to me it is equally probable, that, though compression is not the first cause of sleep, it completes and preserves that state, and without which it would never take place,

I am persuaded of the truth of this from a variety of considerations.

The mechanism of the brain, which is calculated to retard and accumulate the blood in this organ, while no other use, equally probable, can be assigned, (except giving a certain degree of energy to the *nervous system*)* is sufficient evidence, in a case intricate as the present, to warrant the assertion.†

“ Beside

* On one, the most simple principle, nature accomplishes two of the most important ends in the animal æconomy, EXCITEMENT and COLLAPSE.

† This explanation of the *SENSORIUM* does away what has hitherto been considered a *DESIDERATUM* in *PHYSIOLOGY*; to wit, a reason

“ Beside the causes now mentioned occasioning apoplexy by compression, I alledge there are other causes producing the same disease, by directly destroying the mobility of the nervous energy. Such causes seem to be mephitic air arising from ferment-

why a greater quantity of blood is distributed to this organ than is necessary for its nourishment. On this has been built the favourite hypothesis of the **NERVOUS FLUID**. If we reason from analogy, (say they;) the brain is a **GLAND**, destined for the secretion of a peculiar fluid; it being a fact, that, whenever a greater quantity of blood is sent to any organ than is required for its support, it is intended for secreting from the circulating mass a certain something **SUI GENERIS**. To this rule there are objections; the **SPLEEN**, **PANCREAS**, and **CAPULÆ RENALES**; in none of which have we any evidence of their glandular structure, no **EXCRETORY DUCT** having been discovered; nay, I may with propriety say never will.

The explanation given is consistent with the more remote causes of sleep. Exercise of the various functions of the body, by exhausting the energy of the system, favours congestion in the vessels of the brain; for, as the vessels of this part forward their blood by their own energy and the vis-tergo; so, in cases of general debility, parts thus situated, are most readily surcharged; and hence the **HEAD**, **THORACIC**, and **ABDOMINAL VISCERA** are most frequently affected with congestion. In this way Nature compels the most obstinate to yield, and enforces recreation. We have a further illustration of this from the somniferous effects of cold. We all know, that when exposed to a degree of extreme cold, we become drowsy; and, sensible of the impending evil, in vain we resist, sleep approaches, and, if the cause continues, we expire without a sense of pain, anxiety, or regret. I conceive that cold produces these effects, by diminishing the energy of the system; the heart, unable to exert its usual force, propels the blood with difficulty in the extreme parts, and, therefore, it accumulates internally, but more particularly in the vessels of the brain, for the reasons before given.

A difficulty here arises—if congestion is the cause of sleep, what solution will be given, why a person can be instantly awake? Compression from extravasation, and that from congestion in the vessels, are different with respect to duration. In the first, compression can only be relieved by absorption, while, in the latter, a restoration of action alone is all that is requisite; therefore, on the cause of excitement being given, he is awake;

ing liquors, and from many other sources; the fumes arising from burning charcoal; the fumes of mercury, of lead, and some other metallic substances; opium, alcohol, and many other narcotic poisons: To which I would add the power of cold, of concussion, of electricity, and of certain passions of the mind.

“None of these poisons, or noxious powers, seem to kill by acting on the organs of respiration, or sanguiferous system; and I believe their immediate and direct operation to be on the nervous power, destroying its mobility; because these poisons shew their power in destroying the irritability of muscles, and of the nerves connected with them, when both these are entirely separated from the rest of the body.

“With respect, however, to the circumstances which may appear on dissection of persons dead of
apoplexy,

but even this is not immediately, for frequently he continues in a state of semi-watching for some time; and when he is revived, on withdrawing the cause, he sinks in the same state; and if he does not, it is only after some time that the watching state is completed.

I conceive, however, that the causes principally to be noticed in explaining the phenomenon of sleep, is a peculiar organization and habit. We have a beautiful illustration of this in the organ of voice: here the most astonishing phenomena in the animal machine depend on peculiarity of organization, and a facility of action in the muscles subservient, acquired by repetition: so the same causes referred to the *SENSORIUM*, may produce congestion and inanition not to be expected a priori; and hence the cause of children sleeping so much more than adults, and as they advance to puberty of its gradually diminishing.

apoplexy, there may be some fallacy in judging from those of the cause of the disease. Whatever takes off, or diminishes the mobility of the nervous power, may very much retard the motion of the blood in the vessels of the brain, and perhaps to a degree of increasing exhalation, or even of occasioning rupture and effusion; so that, in such cases, the marks of compression may appear upon dissection, though the disease had truly depended on causes destroying the mobility of the nervous power. This seems to be illustrated and confirmed from what occurs in many cases of epilepsy: in some of these, after a repetition of fits, recovered from in the usual manner, a fatuity is induced, which commonly depends upon a watery inundation of the brain; and in other cases of epilepsy, when fits have been often repeated without any permanent consequences, there happens at length a fatal paroxysm; and, upon dissection, it appears that an effusion of blood had happened. This, I think, is to be considered as a cause of death, not a cause of the disease; for, in such cases, the disease had diminished the action of the vessels of the brain, and thereby given occasion to a stagnation, which produced the appearances mentioned. And, I apprehend the same reasoning will apply to the retrocedent gout, which, by destroying the energy of the brain, may occasion such a stagnation as will produce

rupture, effusion, and death; and in such cases the appearances might lead us to think that the apoplexy had depended entirely on compression."

In these quotations we have the authority of Doctor Cullen, together with extreme plausibility, to shew, that concussion, though it produces debility in the nervous system, is attended with compression.

This the Doctor will not admit as a cause of the disease, but as an effect of death, for what reason I am at a loss to say.

I might with equal propriety contend, that extravasation or depression of bone from external violence; were not the causes of an apoplexy in such instances, because they were occasioned by external violence; and, therefore, the force applied is the cause, and extravasation or depression of bone, the effect of death: For what is the difference, whether the effusion or extravasation is the effect of rupture by violence, or rupture and effusion from a want of energy in the vessels?

In the former the apoplexy evidently depends upon extravasation and depressed bone; and it is equally true, that, in the latter, though debility of the nervous energy occasioned the rupture and effusion, debility independent of that would not produce the
apoplectic

apoplectic state; for, if it would, a restoration of energy would be the cure: this is contrary to fact, and therefore debility is the remote, and compression the proximate cause, and not the effect of death.

The fact which I am now to lay down as invariably the case in every instance, and for the truth of which I appeal to every Practitioner experienced in Surgery, that when concussion of the brain is of duration sufficient to fall under the observation of Surgeons and Physicians, it will be found, that the *animal* and *vital functions* were extinguished at the instant of concussion, and that this is momentary: For though the *animal functions* continue in a state of suspension, the *vital* renew their action; and in this state the person remains for an unlimited time,

If concussion, independent of compression, supports the disease under the circumstances I have mentioned, I ask a reason why the *animal* as well as the *vital functions* were not restored:

A reply to this question I conceive will be difficult, and a rational solution only can be given on the principle of compression.

That debility alone does not exhibit the phenomena, I conclude from hence, that if it did, there would

be no pause at the *vital*, and the *animal functions* would be restored in the same progression: This, however, is otherwise; for the *animal functions* do not proceed to a restoration of action in the same progression, but remain in a state of abolition for a considerable time, and at length frequently end in death.

This is a stubborn objection to the doctrine of concussion independent of compression, and we must pursue some other course to arrive at the truth. I would attempt it in this way: Violence of *excitement* from concussion terminates in a state of *collapse* analogous to *syncope* from joy.

I confess, that, in this state, the necessity of compression does not appear; I presume at the same time, that extravasation accompanies the excitement, or, that congestion in the vessels takes place at the time of *collapse*.

If *syncope* from joy does not terminate in a state of irrecoverable *collapse*, it in a few moments disappears, and excitement returns; so, in case of *collapse* from concussion, the same takes place, except with this difference, that in *syncope* excitement is restored to the whole system; whereas, in concussion, to the *vital functions* only.

The following is the reason.

I have stated it as a principle in *physiology*, that a cause, capable of suspending the *animal*, may be inadequate to produce the same effect on the *vital organs*: Now, I conceive, that in the instance of concussion, life is suspended from *collapse* only, and the excitement is restored to the *vital functions*; because extravasation or congestion in the vessels producing compression, exists at the same time; and though inadequate to any manifest injury on the *vital*, is competent to a loss of the *animal functions*.

Bell, in his System of Surgery, says, “ So far as my observation goes, the most material difference which occurs between the symptoms produced by these two causes, concussion and compression, is met with in the pulse and in the breathing,

“ In a compressed state of the brain, the breathing is commonly deep and oppressed, similar to what most frequently takes place in apoplexy; whereas, in patients labouring under commotion or concussion, the breathing is in general free and easy, and the patient lies as if he was in a sound and natural sleep. The pulse is commonly soft and equal, and not irregular and slow, as it usually is found to be when the brain is compressed.

“ In

“ In case of compressed brain too, although little or no relief may be obtained from blood-letting, yet no harm is observed to accrue from it; for in such circumstances it may be prescribed in moderate quantities, without reducing either the frequency or strength of the pulse; whereas, in real concussion of the brain, the pulse, as we have already remarked, will frequently sink, and become more feeble on the discharge of only eight or ten ounces of blood.”

These observations, on the circumstances of the two diseases, may induce an inattentive observer to adopt the distinction; but, I apprehend I shall be able to account for the variety quoted, and admit the existence of compression.

There is a state of the arterial system which *pathologists* have named *phlethora ad vires*; and we all know the existence of *inanition* produces an opposite state; the compression being given, these two states of the sanguiferous system will give the variety: For instance, if a *phlethora ad vires* should exist in one, and *inanition* in another, the first will present the symptoms of compression; the second will exhibit the phenomena of concussion.—In support of this an explanation may be required.

The pulse in *pblethora ad vires* is irregular, slow and oppressed, and corresponds to that of compression. This does not arise from a want of energy in the *nervous system*, but from the equilibrium between the *arteries* and their contents being destroyed, from the predominancy of the latter.

The same consideration accounts for the deep and oppressed breathing; for, as this *organ* is a mixture of voluntary and involuntary, and as the *animal functions* are suspended, the *muscles*, subservient to the organ of respiration, refuse their assistance; and hence the state of respiration in compression. Further, the blood is accumulated in the right *auricle* and *ventricle* of the *heart*, from the slowness of respiration, the diminished energy of the *heart* and *pblethora*; and, therefore, a deep inspiration is necessary to the transmission of the accumulated blood.

The breathing is free and easy, the pulse soft and equal in concussion, and answers to that of sleep.

I have no doubt but Practitioners have been deceived by those circumstances of the breathing and pulse, because I shall now prove them to depend upon compression.

The cavity of the *cranium* being given, and always the same, at different times it will be more or less completely

completely filled, according to the state of the *vessels* of the *brain*. If two persons of unequal states of *phlethora* should have accumulated in the scull the same quantity of matter; one may receive compression equal to a complete state of *apoplexy*, and the other shall receive no injury, or if he does it will be in a less degree; for the accumulation being given, the compression will be in proportion to the *phlethoric state* of the *brain*.

A more inconsiderable accumulation and state of *inanition* of the *vessels*, will explain why a soft, equal pulse, and a free, easy respiration takes place in this instance and not in the other. As respiration is in some degree under the influence of the *will*, it will be impaired in proportion to the loss of the same; and as the degree of respiration required will be in proportion to the quantity of blood to be circulated by the *lungs*, we have a reason, without the necessity of a comment, why the state of the *vital organs* corresponds to a state of *sleep*, having previously shewn this phænomenon to depend on compression.

Dissection, so frequently the resource of Surgeons, is often fallacious.

We have it roundly asserted in books of surgery, that after the most attentive examination of many
who

who died of concussion, they were not able to discover the least vestige of compression.

It would be illiberal to charge the authors of such dissection with wilful misrepresentations of the result of their inquiries; but, I may with the strictest propriety observe, that it did exist in every such instance, though it eluded the eyes of those blinded by prejudice.

I shall anticipate the reply to this observation, that the same result has attended the pursuits of the warmest advocates for compression: I admit the fact, but deny the force of this as an objection.

Compression from external violence has hitherto been considered as produced by extravasation, depressed bone, and the introduction of foreign substances: was this a fact, I should be in some measure defeated by the energy of their dissections: but, compression from concussion is frequently the effect of congestion in the vessels of the brain.

Again, though extravasation should exist in those instances in which we are told dissection has disproved, I say, I can easily conceive, that the most accurate and liberal dissectors may have been deceived; for the extravasated matter necessary to produce this effect under particular circumstances,

is too inconsiderable to strike the senses, unless the same be subjected to the most suspicious examination.

The circumstance I have just mentioned is not the only cause of error in such cases; for the seat of compression has generally been considered as existing between the *duramater* and *cranium*, the former and *pia mater*, or the latter and *brain*: I conceive, however, that extravasation may with equal facility take place in the substance of the *brain*, or some other internal part, as those formerly mentioned.*

Further, extravasation of blood is not a necessary consequence of rupture of the vessels of the *brain* from concussion; for serum only may be, and frequently is effused, and proves a cause of compression.

Now, from the facts which I have just mentioned; to wit, a false idea of the seat of compression, a partial knowledge of the causes, and from the inconsiderable quantity of extravasated matter necessary to produce this effect, it is probable, that dissection has done little more than nourish an absurd preconceived opinion.

As congestion in the vessels of the *brain* is the cause in many instances of compression from concussion,

sion, the reason is obvious, why dissectors have been so often baffled in discovering a cause of compression.

If they had no suspicion of the existence of such a cause, is it probable that if it did exist, it would fail under their observation? I answer no; because the nature of congestion may be, and generally is such, as to render its existence ambiguous to those who contend for its presence,

The celebrated Bromfield and others found, from long extensive experience and much observation, that the *asthenic* plan was too rigidly observed; and therefore, without a knowledge of the cause of the inefficacy of their practice, *empirically* ventured to relinquish the same, and submit to *sudorifies* in such cases.*

I have no doubt that the indiscriminate practice of *venesection* in concussion is often injurious; and I am equally certain, that *sudorifies*, *cathartics*, and every other part of the *asthenic* plan, are no less ambiguous under particular circumstances.

I am led to believe, both from *theory* and *practice*, that the fatality of this disease is owing to the prejudice in favour of system, whereby, practising from general indications, many and insuperable errors are committed.

If

If the mortality of this disease has abated since Surgeons and Physicians have suspected the propriety of *bleeding* in every instance, and all stages of the disease, we have reason to conclude, that, if for the *asthenic* they had submitted the *sthenic*, the proportion of deaths in such instances would have much diminished.

I am at a loss to say, why the author of the present System of Surgery has advanced the experience and observations of Bromfield, in support of his ridiculous hypothesis on the proximate cause of concussion.* I admit that it is evidence of the existence of debility; but this I shall shew is not a cause, but a necessary consequence of that state of the *brain*.

The exercise of the *intellectual faculties*, *sense*, *voluntary motion* and *respiration*, are direct stimulants to the system, and the only cause and support of its activity.

It is now a notorious fact, that *respiration* is a process analogous to combustion; and that the office of the *minor circulation* is to impregnate the blood with what, in the new nomenclature of the French chemists, is known by *oxigene*, and to prove the source of *animal heat*.

It

* Bell's System of Surgery.

It is equally well established, that the existence and exercise of this *function* is essential to animal life: it appears further, that the presence of *oxigene* is necessary to the action of the *heart* and *arteries*, it being the natural and only stimulus capable of supporting the same.

Now, whoever will reflect calmly on what has been submitted on the *animal* and *vital functions*, may easily conceive from the subduction of stimulus, that in every case of compression of any duration, debility must be the result.

In this way I presume the disease proves fatal.

In all instances of inanition, existing at the time of extravasation or congestion, in consequence of concussion, I say, bleeding is an ambiguous remedy, because the indication is to take off compression by the removal of extravasated or infarcted matter: this can only be effected by absorption and a restoration of energy to the infarcted vessels.

A question here arises, Is venesection adequate to, or compatible with the indication?

This is a subject equal to an Inaugural Essay, and improper to be discussed at present; I shall only remark, that in my opinion it is.

The success of Bromfield's practice appears to be the result not of judicious prescriptions, but a lesser degree of improper practice.

We adduce, from their own experience, the most invincible evidence of the non-existence of debility, as the proximate cause.

All the champions for this favourite hypothesis speak favourably of the use of *catbartics*, as affording singular relief.

It is almost unnecessary to remark, that the energy of the *brain* depends upon a certain state of tension in the vessels of the same, as is obvious from depletion producing *syncope*: examples of which we have in the removal of a ligature from the arm in venesection, *paracentesis thoracis et abdominis*, and *parturition*.

The indication of cure, (agreeable to Bell and others) is to *invigorate* the *system*.

Who can reflect on such singular inconsistency without disgust!

What are the effects of *catbartics*? To debilitate.

How far they are calculated to fulfil the indication needs no comment.

I presume we are now in possession of an incontrovertible fact, to subvert the stately edifice of brilliant and fertile imaginations.

Does

Does not the invariable and successful practice of *purging* in *phrenitis*, *synocha*, and all other *sthenic* diseases, and the general aversion of Physicians to their exhibition in the *asthenic*, speak a plain language; to wit, that their salutary effects in concussion can never be reconciled to debility as a cause, and, therefore, is one of many in proof of the non-existence of the same?

From the preceding reflections on the proximate cause, it must be obvious, that the theory of the same is the following.

When the brain is subjected to violent commotion, the system is greatly excited; this terminates in a state of collapse analogous to syncope from joy, and generally is of short duration; for the person in a few moments recovers his usual excitement: But sometimes the *vital functions* only recover their action, and the *animal* continue in a state of suspension. In this state of the disease, I presume indirect debility to have no agency in producing the phenomena, and that the disease is supported by compression: Again, that direct debility arises from the subduction of stimulus, and in this way the disease proves fatal.

METHOD *of* CURE.

WE may amuse our fancy, and indulge our ingenuity in visionary speculations on the *theory* of *diseases*; but, the interposition of *art* in administering relief, is of too serious a nature for such exercise.

As I have dared to relinquish the beaten path, and propose a change in practice, it may be considered necessary that I should, in conformity to custom, shew the fallacy and inefficacy of the *systems* of our predecessors and contemporaries on this subject.

The limited nature of this essay renders such an undertaking impracticable: I presume, however, that the arguments I shall adduce in support of my own, will sufficiently evince the impropriety of those which have preceded.

The observations which I have previously submitted on the subjects of concussion and compression, leave no doubt as to the nature of the proximate cause; and therefore, the indication resulting therefrom is obvious; but to effect the same is ambiguous and difficult.

The indication is to take off compression.

As

As compression in this instance is produced and supported by congestion in the vessels of the *brain*, or extravasation, we can only remove the immediate cause by *absorption*, or a restoration of *energy* to the vessels.

It would be of advantage if we were in possession of circumstances to enable us to distinguish such cases as are occasioned by *extravasation*, from those depending on *congestion* in the vessels; but as this is impossible, and as three fourths of the whole depend on *extravasation*, we must choose the least of two evils—absorption therefore is what we have in view.

As I have confined my inquiries to that variety of compression which arises from concussion or commotion, no indication can present with respect to the operation of the *trepán*.*

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* We are directed by Bell, in his System of Surgery, in all cases of COMPRESSED BRAIN, though we are in possession of no circumstances to direct to the seat of the injury, to TREPAN every accessible part of the CRANIUM.

If ever a thirst for novelty led a man into a labyrinth of folly, we have an instance of it here. Would not a Physician be impeached with insanity, or charged with sporting with the life of his patient, who, in cases of APOPLEXY, should direct the use of the TREPAN? and is not the proximate cause of APOPLEXY the same as that of compression from concussion? If so, have we any one fact, which in compression can require or justify an operation, more than in APOPLEXY? If the operation of the TREPAN was unattended with pain, and of such a nature that we need apprehend no danger from its use, I say, under such circumstances, if the probability of relieving the cause of compression was not more than one of

The remedy in which I repose the greatest confidence, to effect the indication, is *venesection*.

Could I reconcile the idea, that depleting the *sanguiferous system* will increase and invigorate the action of the *absorbent*, I should with ease surmount every difficulty as to the propriety of the remedy: But, as I am not in possession of facts for its support, and as I have no desire to impose, by subtilty of reasoning, on the minds of men, at the expence of my patients, I must relinquish the idea, as wild, visionary and absurd; although adopting it would greatly aid to enforce the system of practice which I wish to establish.

It may be asked, what are the circumstances of this disease, which indicate the use of the *lancet*?

To this I reply, that *venesection* is practised on a principle different from what it is in instances of *phlegmasia*; in the latter we have in view the production of debility, while in the former, my object is to deplete until the symptoms of compression vanish without inducing debility.

Whether

a thousand, the operation would be warranted: But, as the operation is tedious and laborious to the Surgeon, and painful and dangerous to the patient, it is injudicious, wicked and cruel, and will be avoided by all wise, prudent and honest Practitioners.

Whether the patient is of *phlethoric* habit or not, blood should be drawn at certain intervals, until symptoms of relief appear, or death ensues; for the extravasation can only be removed by *absorption*; and as this is a tedious operation, the patient may die from the subduction of stimulus.* Further, as the *vital* is in some measure under the influence of the *animal functions*, and these are in a state of suspension, *venesection*, independent of relieving the patient from the danger of subduction of stimulus, by the same operations, is calculated to promote absorption,

In performing this operation, the following circumstances should be strictly observed:—The blood should flow from a small orifice, so that the stream may not exceed the diameter of a hair: this should be interrupted on the discharge of an ounce, by closing the orifice, and repeated every ten minutes until one of the effects I have mentioned appear.

The situation of the patient should be horizontal, because this will counteract the tendency to a *deliquium animi*.

During the intervals of bleeding, the energy of the system should be supported by the *diffusible* stimuli;

* Browne's Elements of Medicine.

muli; the exhibition of which must be directed by the judgment of the Practitioner.*

I am sensible of the inconveniences which will result from any increase of debility, and I have accordingly directed the evacuation to be made in a manner, which, I conceive, will effect the removal of phlethora, without the accession of debility in proportion to the quantity lost: For two pounds discharged in the way I have prescribed, will not be equal to three ounces from a large orifice, without interruption, and favoured by an erect posture.

I truly lament the necessity of an ambiguous remedy, but as we are in possession of none so probably judicious, the difficulties attending its use must be dispensed with: The objections, though specious; will in a great degree yield to a scrupulous examination.

I have observed, that the *vital* are in some degree influenced by the *animal functions*: Now, as the latter are in a state of suspension, the absorbents will be diminished in proportion to their dependence on the same.

Again,

* These will counteract the enervating tendency of venesection, and thus preserve, under the evacuation, the vigour of the system.

Again, as the cavity of the *cranium* is always the same, and the bulk of the *brain* in proportion to the state of its vessels, I say, it is obvious from these considerations, that, as the extravasation necessary to effect compression is very inconsiderable,* *venesection*, by contracting the *sensorium*, will take off compression; consequently, so far as the energy of the *absorbents* was impaired by this cause, it will be renewed; and the recovered suspended *functions* will afford several sources of stimulus; therefore, the evacuation, so far from enervating, invigorates the system.

The state of the *intestines* should be early attended to; for by discharging the contents of these, the *phlethora* of the head will be relieved by deriving to the inferior parts: This intention will be best effected by stimulating *cathartics*, the best of which is the *mercurius dulcis*; for it not only is attended with this last effect, but, by a *stimulus* given to the absorbents of the *intestines*, communicated by consent to the remainder

* I was present at an operation of the TREPAN, performed by that judicious Physician Doctor William Moore, of this city: in this instance, the patient laboured under a complete compression of the BRAIN, and the extravasated matter did not exceed five grains; on the removal of which he instantly recovered his senses.

remainder of the same system of vessels, promotes absorption.*

When the animal functions are in some measure restored, all further evacuation should be prohibited, and the cure submitted to mercury: But as a recovery of *phlethora* previous to the removal of extravasated matter would occasion a return of the disease, this should be avoided by due attention in preserving a favourable balance between the *ingesta* and *excreta*.

The secondary symptoms so frequently occurring and generally fatal, are attributed to a variety of causes. Mr. Bell has suggested, that matter extravasated or effused between the *cranium* and *pericranium*, by stagnating becomes acrid, stimulates and increases the action of the vessels, and thus produces inflammation, which, by the communication of vessels, spreads to the brain, and in this way proves fatal: I conceive that the same extravasation, effusion, stagnation and inflammation, may equally, and frequently does take place in the cavity of the *cranium*, and is attended with all the inconveniencies mentioned of the former. From this consideration, I
recommend

* On this principle I explain the effects of CATHARTICS in the cure of DROPSIES, and not by the evacuation giving occasion to absorption.

recommend the continuance of mercury for a considerable time, even when all symptoms of the disease have entirely disappeared; and if this be strictly enjoined, that train of symptoms so much feared, often occurring, and in nineteen cases of twenty terminating in death, will be avoided.

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